Lesson 5-8

Problem: 3  Set: Exercises  Page: 369

Look in your textbook for this problem statement.

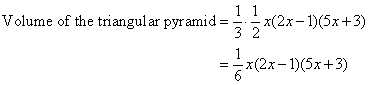
The volume of a triangular pyramid is given by the formula,

http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image004.gif.

Here base is a triangle whose area is given by http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image005.gif, where *b* is the length of the base and *h* is the height of the triangle.

Substitute the given values.

http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image006.gif



Equate the expression for volume to 210.

http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image008.gif

Simplify the equation.

Multiply both sides of the equation by 2.

*x*(2*x* – 1)(5*x* + 3) = 1260

Multiply the factors on the left side.

(2*x*2 – *x*)(5*x* + 3) = 1260

10*x*3 + 6*x*2 – 5*x*2 – 3*x* = 1260

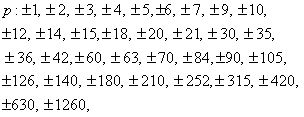
Simplify.

10*x*3 + *x*2 – 3*x* = 1260

Subtract 420 from each side.

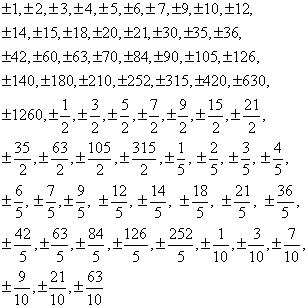
10*x*3 + *x*2 – 3*x* – 1260 = 0

If http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image001.gifis a rational zero, then *p* is a factor of 1260 and *q* is a factor of 10.



http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image010.gif

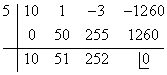
Write the possible values of http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_3_393/image001.gifin simplest form.



There is one sign change in the function. Therefore the equation has one positive real root.

Use synthetic division to find the zero.

By using trial and error method, you can find that 5 is a zero.



Since there is only one positive zero, we don't have to test the other numbers.

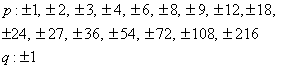
Substitute 5 for *x* in the expressions for side lengths.

The dimensions are 5, 9, and 18.

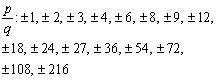
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Look in your textbook for this problem statement.

If http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_45_395/image001.gifis a rational zero, then *p* is a factor of 216 and *q* is a factor of 1.

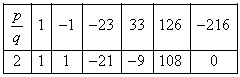


Write the possible values of http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_45_395/image001.gifin simplest form.

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Use synthetic division to find the zeros.

Make a table and test some possible rational zeros.

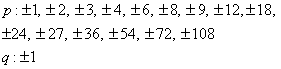


Since *f*(2) = 0, there is a zero at 2.

The depressed polynomial is *x*4 + *x*3 – 21*x*2 – 9*x* + 108.

Factor the depressed polynomial by synthetic division in the same way.

If http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_45_395/image001.gifis a rational zero, then *p* is a factor of 4 and *q* is a factor of 9.



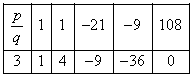
Write the possible values of http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_45_395/image001.gifin simplest form.

**http://hotmath.com/help/solutions/holliday210/6/8/Exercises/holliday210_6_8_Exercises_45_395/image101.gif**

Use synthetic division to find the zeros.

Make a table and test some possible rational zeros.

Using trial and error, you can find that 3 is a zero.



The depressed polynomial is *x*3 + 4*x*2 – 9*x* – 36.

Factor the depressed polynomial by grouping.

*x*3 + 4*x*2 – 9*x* – 36 = (*x*3 + 4*x*2) + (– 9*x* – 36)

= *x*2(*x* + 4) – 9(*x* + 4)

= (*x* + 4)(*x*2 – 9)

Equate the function to 0 and solve for *x*.

(*x* + 4)(*x*2 – 9) = 0

By, the Zero Product Property,

(*x* + 4) = 0 or (*x*2 – 9) = 0

*x* = –4 or *x*2= 9

*x* = –4 or *x* = ± 3

Therefore, the zeros of the function are –4, –3, 2, 3 and 3

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|  | |  | | --- | | **MANUFACTURING** A box is to be constructed by cutting out equal squares from the corners of a square piece of cardboard and turning up the sides.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=17%3a%5E%14%0B%09X%1C%04%02J%08U    **a.** Write a function *V*(*x*) for the volume of the box.  **b.** For what value of *x* will the volume of the box equal 1152 cubic centimetres?  **c**. What will be the volume of the box if *x* = 6 centimetres? | |  |

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|  | **SOLUTION:** |
|  | |  | | --- | | **a**. The length and width of the box would be (28 – 2*x*) and the height would be *x*.  The volume function of the box is:    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=48%3A%251F%2501K%255CU%2506TQUp%2512    **b.**  Substitute *V*(*x*) = 1152 cm3 in the volume function.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=2%3AJ%255F%250AKV%2512%2507%2503IgW    Since the length and width of the box are both equal to 28 cm, if *x* = 18, then 2*x* = 36 which is greater than 28 cm. Therefore, the volume of the box will be equal to 1152 cubic centimeters when *x* = 2 or *x* = 8.    **c.** Substitute *x* = 6 in the volume function.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=28%3aX%04m%15%1C%0B%06%01Y%0DM | |

Q42

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|  | |  | | --- | | Refer to the graph.  http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=63%3a%18%02Jjt%5CXf%12%06%08  **a.** Find all of the zeros of *f*(*x*) = 2*x*3 + 7*x*2 + 2*x* – 3 and *g*(*x*) = 2*x*3 – 7*x*2 + 2*x* + 3.  **b.** Determine which function, *f* or *g*, is shown in the graph at the right. | |  |

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|  | **SOLUTION:** |
|  | |  | | --- | | **a.** Zeros of *f*(*x*):  The possible rational zeros are:    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%13    Test for some possible zeros using synthetic division.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%10    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%11 is one of the zeros of the function and the depressed polynomial is http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%16.  Factor the depressed polynomial and find its zeros.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%17    The zeros of the polynomial *f*(*x*) are http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%14.  Zeros of *g*(*x*):  The possible rational zeros are:    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%18%15    Test for some possible zeros using synthetic division.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%1C    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%1D  is one of the zeros of the function and the depressed polynomial is http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%12.  Factor the depressed polynomial and find its zeros.    http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%13    The zeros of the polynomial *g*(*x*) are http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%10.  **b.** From the graph, the zeros of function are at http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=37%3a%18H%14M%09%14Car%1F%11.  Therefore, it is the graph of  *g*(*x*). | |

Q46

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|  | |  | | --- | | **CCSS CRITIQUE** Doug and Mika are listing all of the possible rational zeros for *f*(*x*) = 4*x*4 + 8*x*5 + 10*x*2 + 3*x* + 16. Is either of them correct? Explain your reasoning.  http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=67%3a%60TWm%1C%0B%06ANbB  http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=67%3a%60TWm%1C%0B%06ANbA | |  |

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|  | **SOLUTION:** |
|  | |  | | --- | | Sample answer: Doug; the value of *q* is the leading coefficient, which is 4, not 8. | |

Q48

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| |  | | --- | | **REASONING** Determine if the following statement is *sometimes*, *always*, or *neve*r true.  Explain your reasoning*. If all of the possible zeros of a polynomial function are integers, then the leading coefficient of the function is* 1 or -1. | |  |

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|  | **SOLUTION:** |
|  | |  | | --- | | Sample answer: Always; in order for the possible zeros of a polynomial function to be integers, the value of *q* must be 1 or -1. Otherwise, the possible zeros could be a fraction. In order for *q* to be 1 or -1, the leading coefficient of the polynomial must also be 1 or -1 | |

Q51

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|  | |  | | --- | | **WRITING IN MATH** Explain the process of using the Rational Zero Theorem to determine the number of possible rational zeros of a function. | |  |

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|  | **SOLUTION:** |
|  | |  | | --- | | Sample answer: For any polynomial function, the constant term represents *p* and the leading coefficient represents *q*. The possible zeros of the function can be found with http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=60%3a%1DP%0C%0C%0AJe%7FR%5Ea where the fraction is every combination of factors of *p* and *q*. For example, if *p* is 4 and *q* is 3, then http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=60%3a%1DP%0C%0C%0AJe%7FR%5E%60, and http://esolutions.mcgraw-hill.com/GetCogneroMedia.ashx?id=60%3a%1DP%0C%0C%0AJe%7FR%5Eg are all possible zeros. | |